

**I. PROJECT PLANNING (23%)** - Establish project objectives and develop scope of hydrogeologic work.

<i>Subdomain</i>	<i>Task</i>	<i>Knowledge</i>
A. PROBLEM DEFINITION (11%)	<p>T6. Identify needs for water supply protection.</p> <p>T11. Identify needs for water supply restoration/remediation.</p> <p>T16. Identify need to perform a contamination assessment based on legal/regulatory requirements.</p> <p>T25. Identify groundwater management issues and alternatives.</p> <p>T29. Identify potential sources of water supply.</p> <p>T33. Identify water resource impacts on designated beneficial use.</p> <p>T45. Identify consequences of groundwater management decisions on future land and water uses.</p> <p>T60. Develop a conceptual hydrogeologic model.</p>	<p>K1. Knowledge of the major components of groundwater supply systems.</p> <p>K6. Knowledge of the sources of hydrogeologic data and their meanings.</p> <p>K11. Knowledge of the hydrologic cycle.</p> <p>K16. Knowledge of beneficial use as designated by state law.</p> <p>K26. Knowledge of the effect of federal, state, and local water quality standards on the evaluation of water quality data.</p> <p>K31. Knowledge of specific regulatory agencies that have jurisdictional authority over a water supply.</p> <p>K35. Knowledge of specific regulatory agencies that have jurisdictional authority over water quality protection.</p> <p>K43. Knowledge of the methods to develop conceptual hydrogeologic models.</p> <p>K47. Knowledge of the effects of existing site conditions on field studies.</p> <p>K88. Knowledge of the hazards of chemical contaminant exposure.</p> <p>K116. Knowledge of the standards of practice for site investigation and remediation.</p> <p>K130. Knowledge of general hydrogeology of Washington.</p> <p>K131. Knowledge of regulations pertaining to water rights and water law in Washington.</p>

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<i>Subdomain</i>	<i>Task</i>	<i>Knowledge</i>
B. APPROACH (12%)	<p>T21. Identify need for control of groundwater flow direction or head relevant to engineered controls.</p> <p>T37. Identify consequences of changes to water table or potentiometric surface.</p> <p>T49. Identify existing site conditions that may constrain investigation approach.</p> <p>T56. Prepare schedule and identify location for soil and/or groundwater remediation.</p> <p>T64. Develop an investigation approach to achieve project objectives.</p> <p>T68. Identify type, collection methods, quantity and quality of data needed to achieve project objectives.</p> <p>T76. Develop a groundwater investigation workplan.</p> <p>T80. Develop a groundwater monitoring program.</p>	<p>K6. Knowledge of the sources of hydrogeologic data and their meanings.</p> <p>K11. Knowledge of the hydrologic cycle.</p> <p>K16. Knowledge of beneficial use as designated by state law.</p> <p>K26. Knowledge of the effect of federal, state, and local water quality standards on the evaluation of water quality data.</p> <p>K31. Knowledge of specific regulatory agencies that have jurisdictional authority over a water supply.</p> <p>K35. Knowledge of specific regulatory agencies that have jurisdictional authority over water quality protection.</p> <p>K43. Knowledge of the methods to develop conceptual hydrogeologic models.</p> <p>K47. Knowledge of the effects of existing site conditions on field studies.</p> <p>K52. Knowledge of the advantages and disadvantages of different site investigation methods.</p> <p>K56. Knowledge of the advantages and disadvantages of different drilling methods.</p> <p>K60. Knowledge of the advantages and disadvantages of different sampling methods.</p> <p>K71. Knowledge of the use and limitations of various aquifer test methods.</p> <p>K72. Knowledge of the advantages and disadvantages of different measurements of field water quality parameter methods.</p> <p>K76. Knowledge of the effects of groundwater on soil and rock stability.</p> <p>K80. Knowledge of the procedures to validate the usefulness of hydrogeologic, hydrologic, and water quality data.</p> <p>K84. Knowledge of the regulations pertaining to health and safety at a worksite.</p> <p>K88. Knowledge of the hazards of chemical contaminant exposure.</p> <p>K92. Knowledge of the advantages and disadvantages of laboratory methods to determine physical properties of soil, rock, water, gas, and waste samples.</p> <p>K96. Knowledge of the advantages and disadvantages of laboratory methods to determine chemical concentrations in soil, rock, water, gas, and waste samples.</p> <p>K100. Knowledge of the components of a monitoring program.</p> <p>K104. Knowledge of statistical methods to evaluate sample populations.</p> <p>K108. Knowledge of permits required for hydrogeologic investigation, construction, and destruction.</p> <p>K112. Knowledge of the elements of groundwater monitoring programs.</p> <p>K116. Knowledge of the standards of practice for site investigation and remediation.</p> <p>K130. Knowledge of general hydrogeology of Washington.</p>

## II. FIELD DATA ACQUISITION (22%) – Perform surface and subsurface exploration and document groundwater conditions.

<i>Subdomain</i>	<i>Task</i>	<i>Knowledge</i>
A. FIELD OBSERVATION (14%)	<p>T7. Verify current conditions and site features in the field.</p> <p>T17. Identify water resource boundaries and zones from available data or field observations.</p> <p>T43. Prepare field notes, boring logs and well construction details to illustrate subsurface conditions.</p> <p>T57. Evaluate the physical condition and construction of existing wells.</p> <p>T63. Identify lithology, stratigraphy, structure, changes in moisture, water levels, and other properties of geologic materials based on field observations to interpret groundwater conditions.</p> <p>T65. Interpret borehole geophysical logs to determine aquifer stratigraphy and properties.</p> <p>T73. Assess well performance.</p> <p>T81. Supervise well drilling, installation, development and testing.</p>	<p>K2. Knowledge of geologic logging techniques.</p> <p>K7. Knowledge of interpretive techniques for aerial photographs and maps.</p> <p>K17. Knowledge of the interaction between groundwater and surface water.</p> <p>K27. Knowledge of borehole geophysical investigation techniques.</p> <p>K32. Knowledge of site reconnaissance and field mapping techniques.</p> <p>K36. Knowledge of the procedures to decontaminate drilling equipment and sampling tools</p> <p>K40. Knowledge of borehole drilling and well completion techniques to prevent cross-contamination of aquifers.</p> <p>K44. Knowledge of drilling techniques and construction practices for different types of water supply wells.</p> <p>K48. Knowledge of state and federal laws, regulations, and policies pertaining to groundwater protection.</p> <p>K53. Knowledge of the classification systems for soil and rock.</p> <p>K55. Knowledge of the methods to determine hydraulic properties of saturated earth materials.</p> <p>K57. Knowledge of the methods to determine hydraulic properties of unsaturated earth materials</p> <p>K59. Knowledge of techniques to site wells.</p> <p>K61. Knowledge of different types of wells.</p> <p>K63. Knowledge of techniques to measure water level in wells.</p> <p>K65. Knowledge of techniques to measure well discharge.</p> <p>K67. Knowledge of the practical significance and implications of equilibrium and non-equilibrium aquifer tests.</p> <p>K71. Knowledge of the use and limitations of various aquifer test methods.</p> <p>K73. Knowledge of field procedures for aquifer tests.</p> <p>K75. Knowledge of the similarities and differences in fractured and porous groundwater flow systems.</p> <p>K79. Knowledge of the techniques to measure groundwater flow in wells.</p> <p>K81. Knowledge of the procedures for assessing background fluctuations in water levels in wells.</p> <p>K83. Knowledge of well bore storage and skin effects on aquifer test results.</p> <p>K85. Knowledge of the techniques to analyze aquifer test data.</p>

**II. FIELD DATA ACQUISITION (22%)** – Perform surface and subsurface exploration and document groundwater conditions.

<i>Subdomain</i>	<i>Task</i>	<i>Knowledge</i>
A. FIELD OBSERVATION (CONTINUED)		<p>K87. Knowledge of the effects of climate data on hydrogeologic investigations.</p> <p>K91. Knowledge of the analytical and numerical methods to determine hydraulic parameters for aquifers.</p> <p>K97. Knowledge of the techniques and procedures used for water budget evaluations.</p> <p>K99. Knowledge of the effects of boundary conditions on water levels during pumping.</p> <p>K101. Knowledge of techniques to construct wells.</p> <p>K105. Knowledge of the techniques to obtain soil samples.</p> <p>K107. Knowledge of the techniques to obtain water samples.</p> <p>K109. Knowledge of the techniques to measure groundwater flow velocity.</p> <p>K115. Knowledge of the techniques to select a filter pack and screen size based on sieve analysis.</p> <p>K117. Knowledge of the limitations of field screening techniques for soil and groundwater samples.</p> <p>K119. Knowledge of inorganic water chemistry.</p> <p>K123. Knowledge of the statistical methods to evaluate soil or groundwater data.</p> <p>K124. Knowledge of the relationship between fresh water and saline water in aquifers.</p> <p>K130. Knowledge of general hydrogeology of Washington.</p> <p>K133. Knowledge of pertinent health and safety regulations.</p>

## II. FIELD DATA ACQUISITION (22%) – Perform surface and subsurface exploration and document groundwater conditions.

<i>Subdomain</i>	<i>Task</i>	<i>Knowledge</i>
B. DATA COLLECTION (8%)	<p>T38. Collect samples of surface or soil gas to evaluate soil or groundwater conditions.</p> <p>T42. Collect samples of soil to evaluate soil or groundwater conditions.</p> <p>T46. Collect samples of sediment or waste to evaluate soil or groundwater conditions.</p> <p>T50. Collect samples of ground or surface water to evaluate groundwater conditions.</p> <p>T53. Obtain physical or chemical parameters from the laboratory to determine interaction between vadose zone and groundwater.</p> <p>T67. Measure groundwater levels or free product thickness from wells.</p> <p>T69. Measure field water quality parameters.</p> <p>T88. Measure water flow and discharge rates.</p>	<p>K2. Knowledge of geologic logging techniques.</p> <p>K17. Knowledge of the interaction between groundwater and surface water.</p> <p>K36. Knowledge of the procedures to decontaminate drilling equipment and sampling tools.</p> <p>K48. Knowledge of state and federal laws, regulations, and policies pertaining to groundwater protection.</p> <p>K53. Knowledge of the classification systems for soil and rock.</p> <p>K55. Knowledge of the methods to determine hydraulic properties of saturated earth materials.</p> <p>K57. Knowledge of the methods to determine hydraulic properties of unsaturated earth materials.</p> <p>K61. Knowledge of different types of wells.</p> <p>K63. Knowledge of techniques to measure water level in wells.</p> <p>K65. Knowledge of techniques to measure well discharge.</p> <p>K87. Knowledge of the effects of climate data on hydrogeologic investigations.</p> <p>K93. Knowledge of the analytical and numerical methods to model contaminant fate and transport.</p> <p>K103. Knowledge of the techniques to obtain gas samples.</p> <p>K105. Knowledge of the techniques to obtain soil samples.</p> <p>K107. Knowledge of the techniques to obtain water samples.</p> <p>K113. Knowledge of fate and transport processes for chemical constituents.</p> <p>K117. Knowledge of the limitations of field screening techniques for soil and groundwater samples.</p> <p>K119. Knowledge of inorganic water chemistry.</p> <p>K122. Knowledge of the physical and chemical properties of organic compounds in soil and groundwater.</p> <p>K123. Knowledge of the statistical methods to evaluate soil or groundwater data.</p> <p>K132. Knowledge of methods to measure water flow and discharge rates.</p> <p>K133. Knowledge of pertinent health and safety regulations.</p> <p>K134. Knowledge of techniques to measure surface water.</p>

**III. DATA EVALUATION (32%)** – Interpret data from historic, field, and laboratory sources and evaluate technical and economic feasibility of groundwater projects.

<i>Subdomain</i>	<i>Task</i>	<i>Knowledge</i>
A. DATA INTERPRETATION (13%)	T2. Identify previous land uses and conditions from photographs, topographic maps, and other available historical sources.	K7. Knowledge of interpretive techniques for aerial photographs and maps. K8. Knowledge of the effects of natural and human activities on groundwater quality, groundwater quantity, and subsurface drainage.
	T8. Interpret hydrogeologic boundaries, heterogeneity, and/or anisotropy from single or multi-well tests.	K17. Knowledge of the interaction between groundwater and surface water. K22. Knowledge of surface geophysical investigation techniques. K23. Knowledge of the effects of climate on natural groundwater recharge K27. Knowledge of borehole geophysical investigation techniques. K28. Knowledge of the principles of groundwater flow pertaining to confined and unconfined aquifers.
	T12. Identify possible recharge/discharge areas from maps, photographs, and historic records.	K32. Knowledge of site reconnaissance and field mapping techniques. K33. Knowledge of the effects of groundwater pumping on confined and unconfined aquifers.
	T26. Identify the applicable data for hydrogeologic analysis by reviewing existing documents, records, maps, and well logs.	K49. Knowledge of the physical and chemical properties of contaminants affecting fate and transport. K53. Knowledge of classification systems for soil and rock. K54. Knowledge of the chemical and biochemical transformations of contaminants. K55. Knowledge of the methods to determine hydraulic properties of saturated earth materials.
	T27. Identify surface water/groundwater interactions.	K58. Knowledge of the conditions that influence gas or fluid flow through an unsaturated/vadose zone.
	T30. Evaluate data to prepare hydrologic inventory/water balance.	K62. Knowledge of the factors that affect migration of contaminants through soil. K66. Knowledge of the effects of hydrogeologic facies on groundwater flow. K67. Knowledge of the practical significance and implications of equilibrium and non-equilibrium aquifer tests.
	T39. Characterize nature and extent of contamination based on laboratory analysis of soil, soil gas or groundwater samples.	K70. Knowledge of artificial recharge methods. K71. Knowledge of the use and limitations of various aquifer test methods. K74. Knowledge of graphical and tabular techniques for analysis and presentation of hydrogeologic data.
	T47. Prepare interpretive hydrogeologic illustrations.	K75. Knowledge of the similarities and differences in fractured and porous groundwater flow systems. K78. Knowledge of the methods to calculate hydraulic gradients.
	T58. Interpret trends from water level and/or quality data.	K81. Knowledge of the procedures for assessing background fluctuations in water levels in wells. K82. Knowledge of the methods to calculate groundwater flow rate and volume.
	T62. Prepare graphical representations of water quality data.	
	T89. Evaluate fluid density effects.	

**III. DATA EVALUATION (32%)** – Interpret data from historic, field, and laboratory sources and evaluate technical and economic feasibility of groundwater projects.

<i>Subdomain</i>	<i>Task</i>	<i>Knowledge</i>
A. DATA INTERPRETATION (CONTINUED)		<p>K85. Knowledge of the techniques to analyze aquifer test data.</p> <p>K87. Knowledge of the effects of climate data on hydrogeologic investigations.</p> <p>K91. Knowledge of the analytical and numerical methods to determine hydraulic parameters for aquifers.</p> <p>K97. Knowledge of the techniques and procedures used for water budget evaluations.</p> <p>K98. Knowledge of the analytical and numerical models that simulate groundwater and vapor phase flow.</p> <p>K99. Knowledge of the effects of boundary conditions on water levels during pumping.</p> <p>K102. Knowledge of the physical models that simulate solute transport.</p> <p>K104. Knowledge of statistical methods to evaluate sample populations.</p> <p>K110. Knowledge of analytical and numerical models that simulate solute transport.</p> <p>K114. Knowledge of the unsaturated flow models that simulate moisture movement in the vadose zone.</p> <p>K118. Knowledge of the models for contaminant fate and transport in the vadose and unsaturated zones.</p> <p>K119. Knowledge of inorganic water chemistry.</p> <p>K120. Knowledge of the methods to evaluate natural attenuation in groundwater.</p> <p>K122. Knowledge of physical and chemical properties of organic compounds in soil and groundwater.</p> <p>K124. Knowledge of the relationship between fresh water and saline water in aquifers.</p>

**III. DATA EVALUATION (32%)** – Interpret data from historic, field, and laboratory sources and evaluate technical and economic feasibility of groundwater projects.

<i>Subdomain</i>	<i>Task</i>	<i>Knowledge</i>
B. DATA ANALYSIS (10%)	T3. Analyze infiltration/percolation data to calculate recharge rates and permeability.	K8. Knowledge of the effects of natural and human activities on groundwater quality and quantity.
	T22. Delineate the nature and extent of groundwater contamination.	K17. Knowledge of the interaction between groundwater and surface water.
	T54. Construct time-series graphs of water level data.	K23. Knowledge of the effects of climate on natural groundwater recharge.
	T66. Calculate vertical and horizontal hydraulic gradients.	K28. Knowledge of the principles of groundwater flow pertaining to confined and unconfined aquifers.
	T71. Calculate hydraulic parameters from aquifer test data.	K33. Knowledge of the effects of groundwater pumping on confined and unconfined aquifers.
	T75. Determine aquifer parameters based on slug test.	K40. Knowledge of borehole drilling and well completion techniques to prevent cross-contamination of aquifers.
	T82. Calculate fate and transport of contaminants in groundwater or vadose zone.	K49. Knowledge of the physical and chemical properties of contaminants affecting fate and transport.
	T85. Prepare groundwater level/potentiometric contour maps.	K53. Knowledge of the classification systems for soil and rock.
	T87. Prepare isoconcentration contour map.	K54. Knowledge of the chemical and biochemical transformations of contaminants.
		K55. Knowledge of the methods to determine hydraulic properties of saturated earth materials.
		K58. Knowledge of the conditions that influence gas or fluid flow through an unsaturated/vadose zone.
		K61. Knowledge of different types of wells.
		K62. Knowledge of the factors that affect migration of contaminants through soil.
		K63. Knowledge of techniques to measure water level in wells.
		K65. Knowledge of techniques to measure well discharge.
		K66. Knowledge of the effects of hydrogeologic facies on groundwater flow.
		K67. Knowledge of the practical significance and implications of equilibrium and non-equilibrium aquifer tests.
		K70. Knowledge of artificial recharge methods.
		K71. Knowledge of the use and limitations of various aquifer test methods.
		K73. Knowledge of field procedures for aquifer tests.
		K74. Knowledge of graphical and tabular techniques for analysis and presentation of hydrogeologic data.
		K75. Knowledge of the similarities and differences in fractured and porous groundwater flow systems.
		K77. Knowledge of the characteristics of nonlaminar flow in saturated and unsaturated systems.
		K78. Knowledge of the methods to calculate hydraulic gradients.
		K81. Knowledge of the procedures for assessing background fluctuations in water levels in wells.



**III. DATA EVALUATION (32%)** – Interpret data from historic, field, and laboratory sources and evaluate technical and economic feasibility of groundwater projects.

<i>Subdomain</i>	<i>Task</i>	<i>Knowledge</i>
B. DATA ANALYSIS (CONTINUED)		<p>K82. Knowledge of the methods to calculate groundwater flow rate and volume.</p> <p>K83. Knowledge of well bore storage and skin effects on aquifer test results.</p> <p>K85. Knowledge of the techniques to analyze aquifer test data.</p> <p>K87. Knowledge of the effects of climate data on hydrogeologic investigations.</p> <p>K90. Knowledge of the physical models that simulate groundwater and vapor phase flow.</p> <p>K91. Knowledge of the analytical and numerical methods to determine hydraulic parameters for aquifers.</p> <p>K93. Knowledge of the analytical and numerical methods to model contaminant fate and transport.</p> <p>K98. Knowledge of the analytical and numerical models that simulate groundwater and vapor phase flow.</p> <p>K99. Knowledge of the effects of boundary conditions on water levels during pumping.</p> <p>K101. Knowledge of techniques to construct wells.</p> <p>K102. Knowledge of the physical models that simulate solute transport.</p> <p>K107. Knowledge of the techniques to obtain water samples.</p> <p>K109. Knowledge of the techniques to measure groundwater flow velocity.</p> <p>K110. Knowledge of analytical and numerical models that simulate solute transport.</p> <p>K113. Knowledge of fate and transport processes for chemical constituents.</p> <p>K114. Knowledge of the unsaturated flow models that simulate moisture movement in the vadose zone.</p> <p>K117. Knowledge of the limitations of field screening techniques for soil and groundwater samples.</p> <p>K118. Knowledge of the models for contaminant fate and transport in the vadose and unsaturated zones.</p> <p>K119. Knowledge of inorganic water chemistry.</p> <p>K120. Knowledge of the methods to evaluate natural attenuation in groundwater.</p> <p>K122. Knowledge of the physical and chemical properties of organic compounds in soil and groundwater.</p> <p>K123. Knowledge of the statistical methods to evaluate soil or groundwater data.</p>

**III. DATA EVALUATION (32%)** – Interpret data from historic, field, and laboratory sources and evaluate technical and economic feasibility of groundwater projects.

<i>Subdomain</i>	<i>Task</i>	<i>Knowledge</i>
C. FEASIBILITY STUDIES (9%)	<p>T4. Evaluate remedial technologies for soil or groundwater.</p> <p>T14. Develop cleanup goals for soil or groundwater remediation.</p> <p>T19. Develop criteria for a groundwater control/remediation system.</p> <p>T31. Estimate potential impacts of water resource development or use.</p> <p>T86. Estimate contaminant levels for use in risk assessment.</p>	<p>K4. Knowledge of the advantages and disadvantages of soil remediation systems.</p> <p>K8. Knowledge of the effects of natural and human activities on groundwater quality, groundwater quantity, and subsurface drainage.</p> <p>K9. Knowledge of the advantages and disadvantages of groundwater remediation systems.</p> <p>K14. Knowledge of comparative costs for hydrogeologic portions of remedial alternatives.</p> <p>K16. Knowledge of beneficial use as designated by state law.</p> <p>K17. Knowledge of the interaction between groundwater and surface water.</p> <p>K19. Knowledge of the techniques and procedures to evaluate water supply alternatives.</p> <p>K23. Knowledge of the effects of climate on natural groundwater recharge.</p> <p>K24. Knowledge of the guidelines to establish cleanup goals.</p> <p>K28. Knowledge of the principles of groundwater flow pertaining to confined and unconfined aquifers.</p> <p>K29. Knowledge of the methods to design and perform pilot tests for water supply or remediation.</p> <p>K33. Knowledge of the effects of groundwater pumping on confined and unconfined aquifers.</p> <p>K45. Knowledge of the types and sources of contaminants associated with specific categories of land use and industrial processes.</p> <p>K49. Knowledge of the physical and chemical properties of contaminants affecting fate and transport.</p> <p>K54. Knowledge of the chemical and biochemical transformations of contaminants.</p> <p>K58. Knowledge of the conditions that influence gas or fluid flow through an unsaturated/vadose zone.</p> <p>K62. Knowledge of the factors that affect migration of contaminants through soil.</p> <p>K66. Knowledge of the effects of hydrogeologic facies on groundwater flow.</p> <p>K70. Knowledge of artificial recharge methods.</p> <p>K82. Knowledge of the methods to calculate groundwater flow rate and volume.</p> <p>K86. Knowledge of the methods to design well fields for groundwater production.</p> <p>K98. Knowledge of the analytical and numerical models that simulate groundwater and vapor phase flow.</p> <p>K118. Knowledge of the models for contaminant fate and transport in the vadose and unsaturated zones.</p> <p>K120. Knowledge of the methods to evaluate natural attenuation in groundwater.</p> <p>K131. Knowledge of regulations pertaining to water rights and water laws in Washington.</p>

**IV. DESIGN, INSTALLATION, AND IMPLEMENTATION (23%)** – Design monitoring and production wells, and design programs for treatment and production systems.

<i>Task</i>	<i>Knowledge</i>
T5. Design a resource protection well.	K5. Knowledge of permit requirements for construction of water supply and treatment systems.
T10. Design a groundwater production well.	K8. Knowledge of the effects of natural and human activities on groundwater quality, groundwater quantity, and subsurface drainage.
T20. Provide hydrogeologic information for design of a water supply system.	K10. Knowledge of permit requirements for operation of supply and treatment systems.
T24. Design a monitoring plan for natural attenuation remedy.	K11. Knowledge of the hydrologic cycle.
T28. Design a monitoring plan for remedial treatment system.	K17. Knowledge of the interaction between groundwater and surface water.
T32. Design a monitoring plan for waste management units.	K20. Knowledge of well construction techniques that prevent cross-contamination.
T36. Verify performance of a remedial system.	K23. Knowledge of the effects of climate on natural groundwater recharge.
T40. Supervise decommissioning of wells.	K25. Knowledge of well construction materials that minimize impact to water quality.
T78. Design a well field including number, location, flow rate, and spacing of wells.	K26. Knowledge of the effect of federal, state, and local water quality standards on the evaluation of water quality data.
T90. Design a monitoring plan for water supply system.	K28. Knowledge of the principles of groundwater flow pertaining to confined and unconfined aquifers.
T91. Design a well rehabilitation plan.	K30. Knowledge of state and federal requirements pertaining to well construction/decommissioning.
T92. Design a dewatering system to meet site-specific requirements.	K31. Knowledge of specific regulatory agencies that have jurisdictional authority over a water supply.
T93. Design a groundwater injection/recharge system.	K33. Knowledge of the effects of groundwater pumping on confined and unconfined aquifers.
T94. Design a wellhead protection plan.	K34. Knowledge of post-closure monitoring requirements.
T95. Provide hydrogeologic information as applied to water rights.	K35. Knowledge of specific regulatory agencies that have jurisdictional authority over water quality protection.
	K38. Knowledge of well design criteria for resource protection wells.
	K39. Knowledge of specific regulatory agencies that have jurisdictional authority over water rights.
	K40. Knowledge of borehole drilling and well completion techniques to prevent cross-contamination of aquifers.
	K42. Knowledge of well design criteria for production wells.
	K43. Knowledge of the methods to develop conceptual hydrogeologic models.
	K44. Knowledge of drilling techniques and construction practices for different types of water supply wells.
	K45. Knowledge of the types and sources of contaminants associated with specific categories of land use and industrial processes.
	K46. Knowledge of well design criteria for vapor extraction wells.
	K48. Knowledge of state and federal laws, regulations, and policies pertaining to groundwater protection.
	K56. Knowledge of the advantages and disadvantages of different drilling methods.
	K58. Knowledge of the conditions that influence gas or fluid flow through an unsaturated/vadose zone.
	K59. Knowledge of techniques to site wells.
	K66. Knowledge of the effects of hydrogeologic facies on groundwater flow.
	K70. Knowledge of artificial recharge methods.
	K75. Knowledge of similarities and differences in fractured and porous groundwater flow systems.
	K78. Knowledge of the methods to calculate hydraulic gradients.

**IV. DESIGN, INSTALLATION, AND IMPLEMENTATION (23%)** – Design monitoring and production wells, and design programs for treatment and production systems.

<i>Task</i>	<i>Knowledge</i>
	<p>K82. Knowledge of the methods to calculate groundwater flow rate and volume.</p> <p>K86. Knowledge of the methods to design well fields for groundwater production.</p> <p>K93. Knowledge of the analytical and numerical methods to model contaminant fate and transport.</p> <p>K98. Knowledge of the analytical and numerical models that simulate groundwater and vapor phase flow.</p> <p>K99. Knowledge of the effects of boundary conditions on water levels during pumping.</p> <p>K100. Knowledge of the components of a monitoring program.</p> <p>K101. Knowledge of techniques to construct wells.</p> <p>K119. Knowledge of inorganic water chemistry.</p> <p>K120. Knowledge of the methods to evaluate natural attenuation in groundwater.</p> <p>K125. Knowledge of the potential impact of groundwater extraction on land subsidence.</p> <p>K131. Knowledge of regulations pertaining to water rights and water laws in Washington.</p> <p>K135. Knowledge of techniques for well rehabilitation.</p>